CLAIMS

Sub A4

1. A method for determining a loss of synchronization between a transmitter and a receiver:

receiving, at a receiver, a plurality of pilot signals having different frequencies from a transmitter;

detecting a phase-frequency relationship of the plurality of pilot signals; and

determining loss of synchronization from the phase-frequency relationship.

2. A method in accordance with claim 1, wherein the phase-frequency relationship comprises a line defined by a relationship between a phase and a frequency of the plurality of pilot signals.

3. A method in accordance with claim 2, wherein determining comprises:

determining loss of synchronization based on a slope of the line.

4. A method in accordance with claim 3, wherein determining further comprises:

determining loss of synchronization if the slope exceeds a timing threshold.

5. A method in accordance with claim 3, wherein determining further comprises:

determining loss of synchronization based on a number of slope-exceeding occurrences.

6. A method in accordance with claim 5, wherein determining further comprises:

determining loss of synchronization when the number of times exceeds an occurrence threshold within a time period.

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7. A method of determining a loss of synchronization between a transmitter and a receiver:

receiving, at a receiver, a plurality of pilot signals transmitted at different frequencies from a transmitter;

determining a slope of a line defined by a phase-frequency relationship of the plurality of pilot signals, the phase-frequency relationship defined by a plurality of phase-frequency values wherein each of a plurality of phase values is uniquely associated with each of a plurality of frequency values;

counting a number of times the slope exceeds a timing threshold; and

determining loss of synchronization between the transmitter and the receiver when the number of times is greater than an occurrence threshold in a time period.

8. A method in accordance with claim 7, wherein determining the slope comprises:

curve fitting the plurality of phase-frequency values using linear regression.

9. A method in accordance with claim 8, further comprising:

adjusting the receiver to synchronize the receiver to the transmitter in response to the loss of synchronization.

10. A phase-frequency slope synchronization detector comprising:

a phase detector adapted to determine a phase value for each of a plurality of received pilot signals transmitted from a transmitter at different frequencies; and

a controller adapted to determine a loss of synchronization between the transmitter and the receiver based on a phase-frequency relationship of the plurality of pilot signals.

11. A phase-frequency slope synchronization detector in accordance with claim 10, wherein the phase-frequency relationship comprises a line defined by a relationship between a phase and a frequency of the plurality of pilot signals.

12. A phase-frequency slope synchronization detector in accordance with claim 11, wherein the controller is further adapted to determine loss of synchronization based on a slope of the line.

13. A phase-frequency slope synchronization detector in accordance with claim 12, wherein the controller is further adapted to determine loss of synchronization if the slope exceeds a timing threshold.

14. A phase-frequency slope synchronization detector in accordance with claim 12, wherein the controller is further adapted to determine loss of synchronization based on a number of slope-exceeding occurrences.

15. A phase-frequency slope synchronization detector in accordance with claim 14, wherein the controller is further adapted to determine loss of synchronization when the number of times exceeds an occurrence threshold within a time period.

16. A receiver for determining a loss of synchronization between the receiver and a transmitter comprising:

a demodulator adapted to demodulate a plurality of pilot signals transmitted at different frequencies from a transmitter; and

a phase-frequency synchronization detector adapted to:

determine a slope of a line defined by a phase-frequency relationship of the plurality of pilot signals, the phase-frequency relationship defined by a plurality of phase-frequency values wherein each of a plurality of phase values is uniquely associated with each of a plurality of frequency values;

count a number of times the slope exceeds a timing threshold; and

determine loss of synchronization between the transmitter and the receiver when the number of times is greater than an occurrence threshold in a time period.

17. A receiver in accordance with claim 16, wherein the phase-frequency synchronization detector is further adapted to determine the slope by applying a curve fitting algorithm using linear regression to the plurality of phase-frequency values.

18. A receiver in accordance with claim 17, wherein the controller is further adapted to adjust the demodulator to synchronize the receiver to the transmitter in response to the loss of synchronization.

19. A multiple-carrier wireless communication system comprising:

a transmitter adapted to transmit a plurality of pilot signals through a wireless communication channel, each of the pilot signals having a unique frequency; and

a receiver adapted to detect a loss of synchronization between the receiver and the transmitter based on a phase-frequency relationship of the pilot signals received at the receiver, the phase-frequency relationship comprising a line defined by a relationship between a phase and a frequency of the plurality of pilot signals.

20. A system in accordance with claim 19, wherein the receiver comprises a phase-frequency synchronization detector adapted to:

determine a slope of the line defined by a phase-frequency relationship of the plurality of pilot signals, the phase-frequency relationship defined by a plurality of phase-frequency values wherein each of a plurality of phase values is uniquely associated with each of a plurality of frequency values;

count a number of times the slope exceeds a timing threshold; and

determine loss of synchronization between the transmitter and the receiver when the number of times is greater than an occurrence threshold in a time period.